INSTRUCTION BOOK

and

OPERATING MANUAL

CITI-FONE

MODEL CD-5A/6 • MODEL CD-5A/12

MULTI-ELMAC COMPANY

OAK PARK 37, MICHIGAN

YOUR "CITI-FONE, MODEL CD-5A, IS DESIGNED FOR FLEXIBILITY, IS RUGGEDLY CONSTRUCTED AND INCORPORATES THE LATEST PROVEN TECHNIQUES IN THE ART OF TWO-WAY RADIO COMMUNICATION.

TO INSURE OPTIMUM PERFORMANCE AND MATCHING TO YOUR ANTENNA INSTALLATION; THE SECTIONS UNDER "OPERATION" SHOULD BE CAREFULLY OBSERVED PRIOR TO OPERATION OF THE "CITI-FONE".

SAFETY NOTICE

Equipment is so designed that when all covers are in place there is no shock hazard. Do not leave the equipment unattended with any of the covers removed.

Maintenance and operating personnel must at all times observe all safety precautions. Under certain conditions, dangerous voltages may exist with the power turned off, due to capacitors retaining a charge. To avoid casualties, always remove the power and discharge or ground all circuits prior to touching them or removing components.

Maintenance personnel should familiarize themselves with the technique of resuscitation found in any First Aid manual.

CITI-FONE

MODELS

CD-5A/6 • CD-5A/12

CITIZEN'S BAND
CLASS "D"
TWO-WAY RADIO TRANSCEIVER

SPECIFICATIONS

TRANSMITTER:

Power input to final;

5 watts. (F.C.C. Max.)

Harmonic & Spurious output;

Greater than 52 DB. down.

Modulation;

High level plate modulated.
Capable of up to 100% modulation.

Frequency Stability;

.005% of better if recommended crystals are used, over the normal operating temperature range.

RECEIVER:

Sensitivity;

.15 microvolts for 4:1 ratio.
.4 microvolts for 10:1 ratio.
Above ratios are for .5 watts audio output.

Selectivity;

6 db. down at + or -3 Kc.
60 db. down at + or -12 Kc.

Audio output;

Less than 10% distortion at 1 watt output.

Noise limiter;

Automatic series gate type.

Squelch circuit;

Operates at .2 microvolts of signal above noise level.

LICENSE REQUIREMENTS

Federal Communications Commission form 505 must be filled out and submitted to the Commission at Washington, D.C., to obtain the station and operators license necessary for the operation of this equipment.

Obtain and read Part 19 of the F.C.C. rules and regulations before filling out form 505 for your license. A copy of Part 19 may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Before operating this equipment you must obtain and have in your possession, your station license with assigned call numbers issued by the F.C.C. and a copy of Part 19 of the rules and regulations. Failure to comply with the Commission's rules and regulations is a Federal offense.

Any adjustments or repairs concerned with the frequency controlling circuits and/or transmitter crystals of this equipment must be made only by persons having in their possession a valid First or Second Class Radiotelegraph or Radiotelephone license issued by the Federal Communications Commission.

CERTIFICATION

The Multi-Elmac Company of Oak Park, Michigan certifies that all Model CD-5A/6 and Model CD-5A/12 Citi-fones meet the F.C.C. requirements under Part 19 of the Commissions rules and regulations regarding frequency tolerance, stability, modulation, power input, and harmonic radiation.

This certification is void if crystals other than those recommended by the Multi-Elmac Co. are installed or the oscillator tuning adjustment seals are broken.

If crystals other than those included in the original purchase are to be added, they must be installed by personnel holding the proper Class of F.C.C. radio operator's license.

GENERAL

The Multi-Elmac Co. "Citi-fone" is a combination receiver, transmitter, and power supply fabricated into a single enclosure. The equipment is designed for low power two-way radio communication over short distances in the Class "D" Citizen's band of frequencies.

The distances over which these units are effective depends upon the terrain, local noise conditions, the type of antennas used and quality of the antenna installation.

Two mobile installations using the short, base loaded type, antenna should give approximately a 3-mile coverage. Full length whip antennas will improve this coverage considerably. Ground plane antennas mounted on a tower at a fixed location should give consistant results over an 8 mile range. Under favorable conditions, these distances may be many times greater.

Polarization of the radiated wave is very important at the frequencies used by this equipment. Therefore, since mobile whip antennas normally mounted on vehicles are vertically polarized a ground plane antenna (also vertically polarized) should be used at the base station. Many antennas are available, that will give optimum radiated signal with vertical polarization.

When operating two fixed installations over a considerable distance "beam" antennas can be used to great advantage. These "beam" antennas will not only improve the signal strength in the desired direction, but will also discriminate against unwanted signals from a different direction. Beam antennas may be either vertically or horizontally polarized.

Power Requirements:

Transmit: 6 volts DC at 8 amperes, 12 volts DC at 4 amperes, or 115 volts AC at 48 watts intermittent.

Receive: 6 volts DC at 6.4 amperes, 12 volts DC at 3.2 amperes, or 115 volts AC at 38 watts continuous.

Frequency Coverage:

Twenty-two (22) channels are available. Provisions are made for selecting any one of five (5) channels by operating a front panel control.

Features:

Adjustable "noise immune" squelch, eliminates background noise when no message is being received.

Built-in series gate type Automatic Noise Limiter.

Switch on microphone designed for push-to-talk operation.

Retractable coiled microphone cord, eliminates tangling of cord.

Transmitting and receiving channels are crystal controlled and selected simultaneously from front panel.

Changing from AC to DC operation is accomplished by changing power cords.

Equipment Supplied:

One model CD-5A/6 or CD-5A/12 complete with microphone, one AC and one DC power supply cord, and one set of two crystals for one channel.

Accessories Available:

Additional sets of crystals for four more channels.
Model AS-1 speaker.

TUBE COMPLEMENT

Schematic Symbol	Tube Type	Circuit Function
V1	6BJ6	R.F. Amplifier
V2	6BE6	Mixer.
V3	6BJ6	First I.F. Amplifier.
V4	6BJ6	Second I.F. Amplifier.
V5	6AL5	Detector and noise limiter.
V6	6EJ7	A.F. Amplifier.
V7	6GW8	Audio power output, Modulator and squelch control.
V8	6BH8	Crystal oscillator, Transmit & Receive.
V9	6AQ5	Final Amplifier, transmitter.

CRYSTAL COMPLEMENT

Channel Frequency	Transmitter Crystal Frequency in Megacycles	Mating Receiver Crystal Frequency in Megacycles
1	26.965	26.510
2	26.975	26.520
3	26.985	26.530
4	27.005	26.550
5	27.015	26.560
6	27.025	26.570
7	27.035	26.580
8	27.055	26.600
9	27.065	26.610
10	27.075	26.620
11	27.085	26.630
12	27.105	26.650
13	27.115	26.660
14	27.125	26.670
15	27.135	26.680
16	27.155	26.700
17	27.165	26.710
18	27.175	26.720
19	27.185	26.730
20	27.205	26.750
21	27.215	26.760
22	27.225	26.770

NOTE: The crystals used in the Citi-fone are third overtone units. .005% frequency tolerance, .486" pin spacing and .050" diameter pins.

For operation on any frequency channel, mating transmitter and receiver crystals must be plugged into corresponding transmitter and receiver crystal receptacles. Note that receiver crystals are always 455 kilocycles below the matching transmitter crystal.

INSTALLATION

GENERAL:

The Citi-fone is completely wired, has all tubes in place, one set of crystals installed in channel one position and is ready for operation as it leaves the factory. However, the appropriate power cord has to be connected between the Citi-fone and the power source, and a suitable antenna system must be provided.

Best results will be realized if the installation is performed by competent, qualified persons. It is recommended that the tuning of the CD5A be checked at the installation, to insure optimum output and efficiency. A complete alignment procedure is discussed under the "MAINTENANCE" section.

One of the power cords supplied is for either 6 or 12 volts DC operation and is fitted with a plug to be inserted into the cigar lighter receptacle of the vehicle. Be sure that the battery voltage of the vehicle is the same as that of the Citi-fone. The voltage that the Citi-fone is wired for is stamped on the rear of the cabinet. The other cord supplied is for 115 volts AC operation. This cord is easily identified by the standard 115 volt plug attached to one end. To convert from AC to DC operation simply exchange cords. For permanent DC installation it is recommended that the power cord be wired direct to the battery. Since a longer wire is normally required, it is recommended that a heavier gauge wire be used. Be certain that the power cord is wired properly if the plug is removed.

MOUNTING:

The handle affixed to the Citi-fone also serves as a mounting bracket. For mobile installations the handle is easily secured to the bottom of the vehicle dash-board. There are two holes provided in the handle for this purpose. The handle may be removed from the cabinet by removing the knurled thumb screws in the side of the cabinet. When used at a fixed or base station the handle can be rotated so it is under the Citi-fone to act as a support to hold the unit in an inclined position.

ANTENNA:

The antenna system is very important and can make the difference between a successful and poor two-way radio communication system. Most efficient communications will result when the antenna is a 52 ohm impedance at resonance and 52 ohm transmission line is used for lead-in. An adapter, (G.C. #29-782), is available at most dealers, to adapt the type PL-259 co-ax plug to the CD5A antenna jack.

The Citi-fone will provide the most efficient operation when connected to an antenna resonated to the center of the 27 megacycle citizen's band. A resonant quarter wave antenna for this band of frequencies is approximately 8-1/2 feet long. However, by using a "base loading coil" the length of the antenna may be reduced considerably.

For fixed or base station use, a ground plane antenna is recommended for best results when working with mobile units. A beam antenna is recommended when working point to point between two fixed stations. Be sure to read Part 19.25(c) pertaining to citizen's band antennas for fixed station use.

NOISE:

Normally, noise should not be a problem in the Citi-fone. However, in mobile installations, it is not uncommon to experience trouble due to ignition noise, generator and voltage regulator hash, or wheel and tire static generated by the vehicle. The disturbing effect created by these sources can be practically eliminated by the proper use of noise suppressors, by-pass capacitors, front wheel static collectors, and if necessary, anti-static powder can be inserted into the tires through the valve stems.

OPERATION

When the Citi-fone is properly installed actual operation is quite simple and should not present any problems.

VOLUME CONTROL and SWITCH:

The Citi-fone is turned on by rotating the volume control knob, located in the lower left of the control panel, in a clockwise direction until a click is heard. A small red glow should be seen through the front panel perforations directly above the control panel; this indicates that the power is on. Continuing the rotating of this knob in a clockwise direction will increase the volume level of the received signal.

SQUELCH CONTROL:

This control, located at the lower right corner of the control panel, is used to quiet the receiver when there is no actual RF signal on the air. It is imperative that the operator understands the proper operation of this control. There is no impairment to the reception of messages, including those from very weak stations, when this control is properly adjusted. Adjust as follows: set the volume control to a comfortable listening level with the squelch control counterclockwise. At a time when there is no signal on the air, advance the control to the point where the receiver becomes quiet. DO NOT ADVANCE THE CONTROL MORE THAN ABOUT 5 DEGREES BEYOND THIS POINT. Advancing of the squelch control beyond this point of quieting will result in the necessity of the transmitted signal from a distant location to be closer or stronger to open the squelched receiver. This fact is of particular importance when operating a mobile unit, since the vehicle will be travelling to areas of various noise levels. It is advisable that the operators of mobile units be made aware of the proper operation of the "Squelch" control, so that maximum range may be realized in the two-way communications system.

CHANNEL SELECTOR:

The channel selector switch is located at the top center of the control panel. This switch selects any one of five pre-set channel frequencies. Both transmitting and receiving channels are selected simultaneously by this control. Remember, any station with which you wish to communicate must be on the same frequency as your Citi-fone. Any of the twenty-two (22) channels available in the class "D" citizen's band may be used in the Citi-fone, however only five (5) channels may be set up at any one time for selection with the channel selector switch.

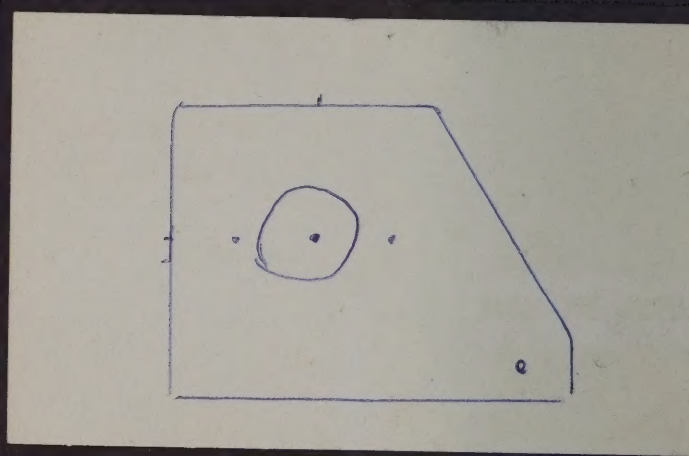
MICROPHONE:

The microphone and the push-to-talk switch located on the side of the microphone are all that have to be operated after the volume control, squelch, and channel selector adjustments have been made.

To talk to another station (on the same channel) merely press the button on the side of the microphone and speak into the microphone. Best results will be obtained when speaking in a normal voice with the microphone held about four inches from your lips and at a slight angle. Do not allow air to pass directly into the microphone when you are speaking as this will cause a rushing or whistling noise to be heard at the receiving end of the two-way installation. Do not shout into the microphone as this will cause distortion in the transmitted speech and make it very difficult for the other party to understand you.

REMEMBER: The button on the microphone must be pressed when you wish to speak and must be released to listen.

RAYTHEON
BONDED
TV-RADIO SERVICE
VERN BICKHAM
Huntsville, Ohio
Tele. 87-2721



MAINTENANCE

The Citi-fone should provide years of reliable operation with a minimum amount of service. The entire circuit has been designed in such a manner that no components are working near their maximum ratings.

ONCE A YEAR PREVENTIVE MAINTENANCE CHECKUP
IS STRONGLY RECOMMENDED.

A once a year checkup will insure that the CD-5A is functioning properly and allow the service technician to find troubles before they create damage that could result in costly repairs. Also, transmit crystals can be checked to insure on frequency operation. The individual owner of the equipment is responsible for the frequency of the transmitter according to FCC rules. However, only those persons having a valid first or second class radio telephone operators license are qualified to service the frequency determining portions of any Citizen's Band equipment.

In the event it is deemed necessary to return the equipment to the factory for service it must be done in the following manner. First: Obtain authorization from the factory. Instructions will then be forwarded as to how and where the equipment is to be returned. Always specify the name of the equipment, the model number, serial number, and the nature of the complaint in any correspondence regarding your unit.

Most component parts used in the Citi-fone are standard and readily available at the nearest electronic supply house. Any special components can be obtained from the factory by submitting information regarding part description, circuit location and model number.

Additional crystals for other channels should be obtained from the dealer where the Citi-fone was originally purchased. When purchasing additional crystals make sure that they are specifically designed and recommended for use in the Citi-fone. You must supply the serial number of your equipment when ordering crystals.

Some installations will result in complaints of hum on the carrier or poor modulation. This can be corrected in most cases by grounding the case of the chassis to any convenient ground. Most 115 volt outlet boxes are grounded, and provide a convenient ground. In the event that this doesn't cure the problem. it is advisable that the microphone be checked to insure that the case of the microphone is grounded through the ground wire in the mike cable. This is accomplished easily by wrapping a piece of tin foil around the rubber piece found inside the back cover of the microphone case.

AMPEREX TUBES ARE RECOMMENDED FOR REPLACEMENT
OF THE 6EJ7 and 6GW8 TUBES.

CAUTION

In the event it becomes necessary to convert the Citi-fone from a 6 volt D.C. unit to a 12 volt D.C. unit the following items must be changed.

1. Change the vibrator. #1601 is for 6 volts, #G1601 is for 12 volts.
2. Change the filament connections as shown on the schematic diagram.
3. Change the power transformer. #934 is for 6 volts.
   #933 is for 12 volts.
4. Change the fuse. 8 ampere slo-blo for 6 volt.
   6.25 ampere slo-blo for 12 volt.
5. Indicate this change on the rear of the cabinet.

VOLTAGE CHART

Pin #	1	2	3	4	5	6	7	8	9
V1	AVC	.8	6.3 ac	12.5 ac	225	85	0	-	-
V2	-1.5 VTVM	1.0	6.3 ac	12.5 ac	185	15	0	-	-
V3	AVC	1.65	0	6.3 ac	210	80	0	-	-
V4	AVC	1.5	0	6.3 ac	210	80	0	-	-
V5	0	0	0	6.3 ac	0	0	0	-	-
V6T	.75	0	.75	0	6.3 ac	0	8.5	34	.75
V6Ra	48	40 VTVM	48	0	6.3 ac	0	170	155	48
V6Rb	46	2.5 VTVM	46	0	6.3 ac	0	215	185	46
V7T	-5.5	-5	215	6.3	12.5 ac	195	5.5	0	0
V7R a	AVC	15	225	6.3 ac	12.5 ac	220	5.8	0	42 VTVM
V7R b	-11	-10	230	6.3 ac	12.5 ac	220	5.8	0	1.5 VTVM
V8T	0	-.6	6.3 ac	0	0	0	-7	115	210
V8R	0	-12	75	6.3 ac	0	0	-	-	-
V9T	-2.0*	0	6.3 ac	12.5 ac	150 †	155	-2.0*	-	-
V9R	0	27	6.3 ac	12.5 ac	220	218	0	-	-

T - Transmit
R - Receive

Ra - Measurements made with squelch control CCW.
Rb - Measurements made with squelch control CW.

* Measure at test point junction between 1K & 15K. (16:1 Ratio.)

† RF Choke in series with meter lead.

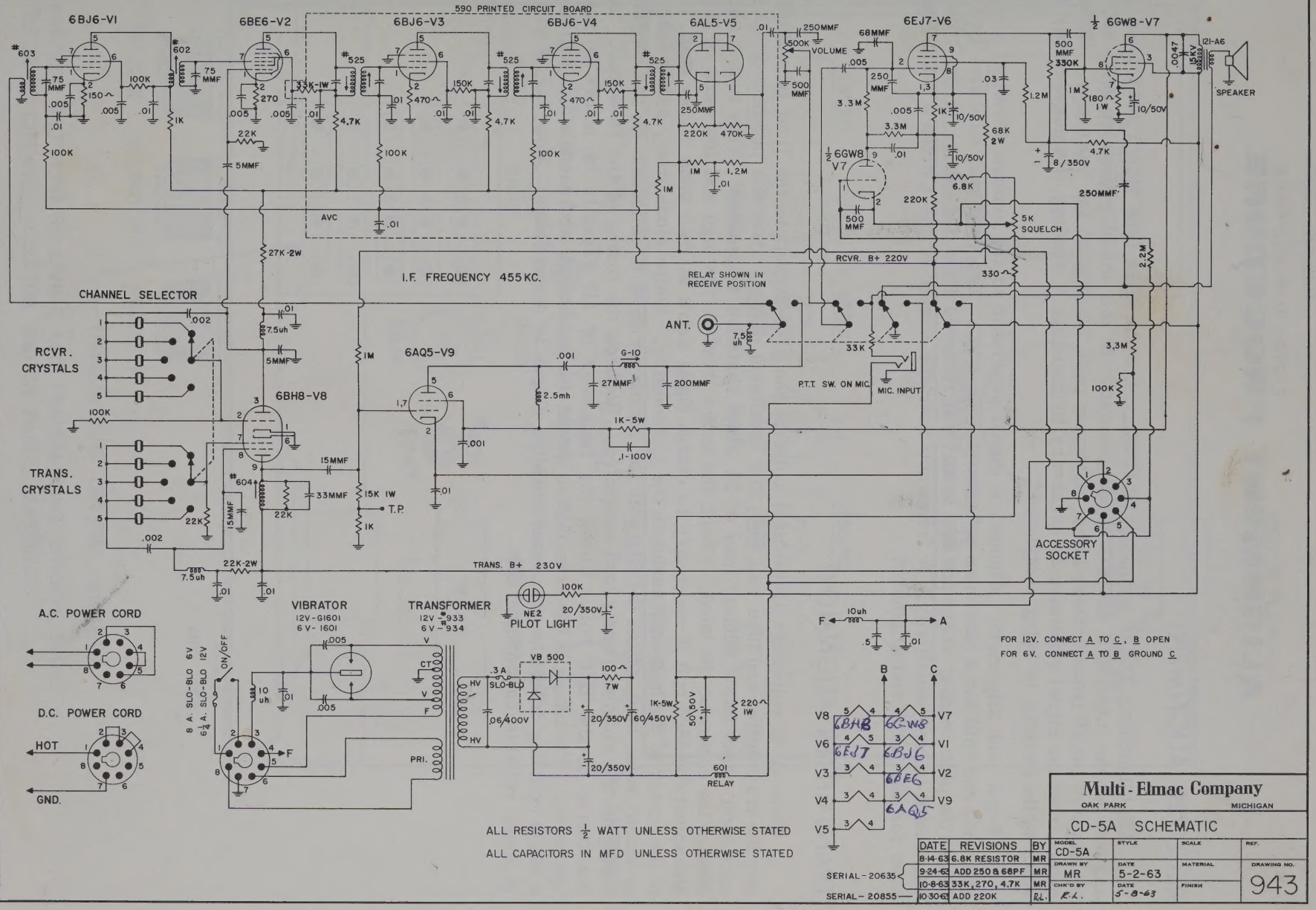
All voltage measurements made with respect to chassis using a Simpson Model 260 multimeter, 20,000 ohms per volt. VTVM used where shown.

RESISTANCE CHART

Pin#	1	2	3	4	5	6	7	8	9
V1	1.4M	150	1	0	55K	160K	0	-	-
V2	22K	1K	1	0	100K	350K	0	-	-
V3	2M	470	0	1	100K	250K	0	-	-
V4	2M	470	0	1	100K	250K	0	-	-
V5	3M	700K	0	1	0	0	470K	-	-
V6	10K	7M	10K	0	1	-	360K	1.3M	10K
V7	3.7M	†	50K	1	2	50K	180K	1.2M	3.3M
V8	0	100K	80K	1	0	0	22K	open	open
V9	16K	open	1	2	50K	50K	16K	-	-

† Depends on Squelch Control Setting, CW-220, CCW-5000

All measurements made, with respect to chassis, using Simpson model 260 multimeter.



DATE	REVISIONS	BY
8-14-63	6.8K RESISTOR	MR
9-24-63	ADD 250 & 68PF	MR
10-8-63	33K, 270, 4.7K	MR
10-30-63	ADD 220K	RL

SERIAL - 20635

SERIAL - 20855

Multi-Elmac Company
OAK PARK MICHIGAN

CD-5A SCHEMATIC

MODEL	STYLE	SCALE	REF.
CD-5A			
DRAWN BY: MR	DATE: 5-2-63	MATERIAL	DRAWING NO. 943
CHK'D BY: R.L.	DATE: 5-8-63	FINISH	

ALIGNMENT PROCEDURE

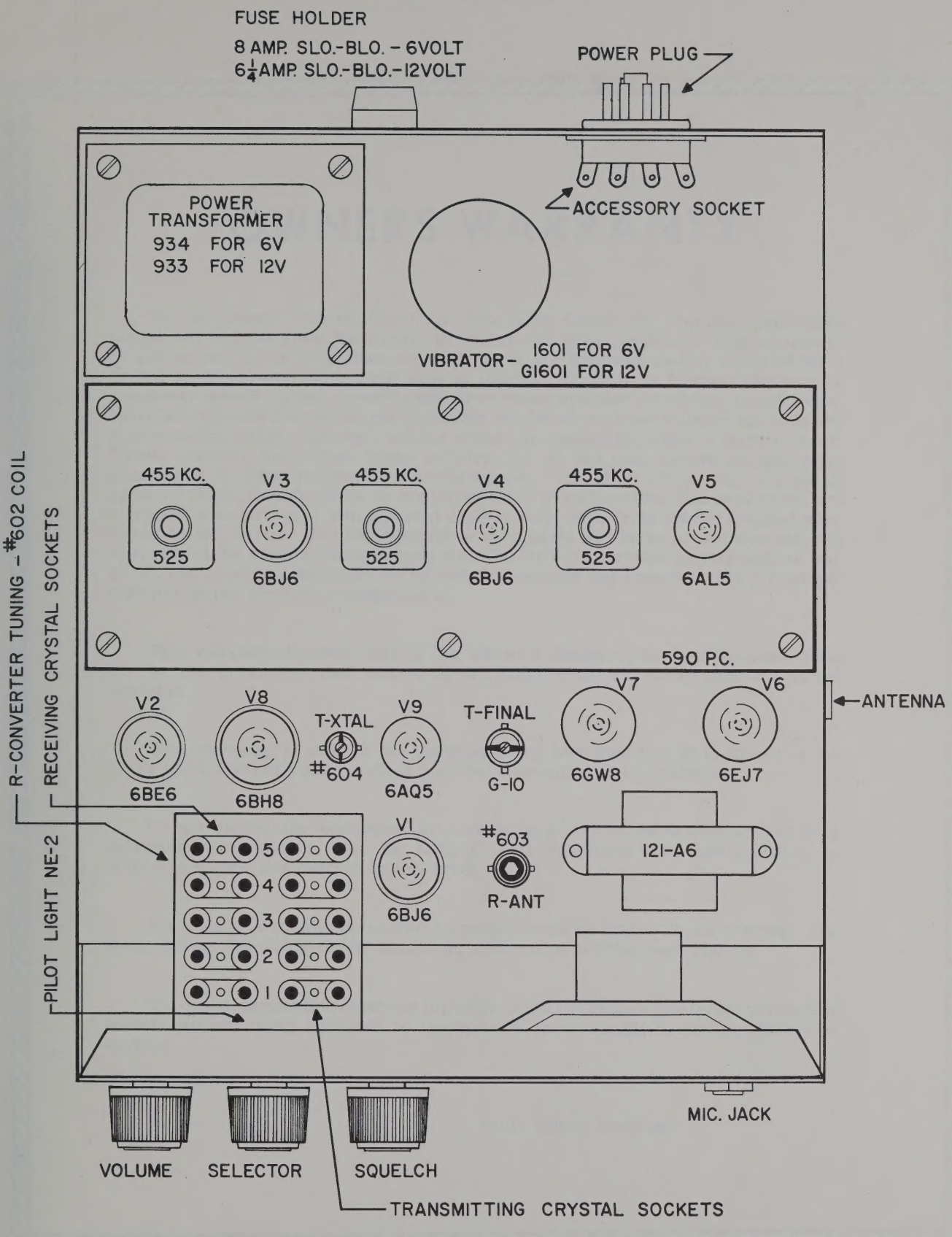
RECEIVER ALIGNMENT:

IF alignment; The IF frequency is 455Kc. Lift the 6BE6 tube shield away from ground and connect the output of a 455 KC signal generator to the shield. Measure AVC and adjust the slugs of the IF transformers for a maximum peak reading on the voltmeter. Reduce the output from the signal generator as necessary to maintain a reading of approximately 2 or 3 volts while peaking is being completed.

Front end alignment: Connect a signal generator to the antenna terminal and adjust coil #602 and #603 for a maximum peak reading on AVC. The #602 coil will give two peaks. Select the peak reading where the slug is farthest removed from the center of the coil. This will result in best sensitivity. A frequency near the center of the Citizen's Band should be used for the front end alignment.

TRANSMITTER ALIGNMENT:

Connect a voltmeter to the test point in the grid circuit of the final tube 6AQ5 (V9). Key the transmitter and tune coil #604 for maximum drive. Tune the output coil (G-10) for maximum output into a dummy load of 52 ohms resistive impedance. This tuning should be done at the center of the band. Check the drive level at the high and low ends of the band, and adjust the #604 coil if necessary to obtain equal drive at both ends of the band. Return to the center of the band and modulate the transmitter. While modulating, either with a tone or steady voice tone, adjust the G10 coil for maximum upward deflection on the output monitoring device with the dummy load connected. Recheck the tuning of the #604 coil. Recheck the tuning of the G10 coil. Check the frequency of all crystals to insure on frequency operation. The tuning of the transmitter output for maximum, with modulation, will result in a slight detuning from the maximum possible output in some cases. However, it will result in more reliable communications.



NUMBERS BETWEEN RECEIVING AND TRANSMITTING CRYSTAL SOCKETS REFER TO CHANNEL SELECTOR SWITCH PANEL MARKINGS

DRAWING 944

'NOTES'

OWNERS WARRANTY

All equipment manufactured by the Multi-Elmac Co. has been thoroughly tested and shipped from the factory in proper operating condition. This equipment is guaranteed to be free from any defects in workmanship and/or material for a period of 90 (ninety) days from date of original purchase as follows: Any part or accessory, except tubes, crystals and other trade articles not of our manufacture, shall be replaced free of charge providing the defect is in our opinion due to faulty workmanship and/or material, and not caused by tampering, abuse or normal wear. Tubes, crystal and other trade articles not of our manufacture are generally guaranteed by their respective manufacturers. The Multi-Elmac Co. will act as agent of these manufactures in replacing such parts provided that such parts are returned to us pre-paid with a period of 90 (ninety) days from date of original purchase by the owner. The replacement of such parts will be in accordance with the warranty of the respective manufacturers. No further guarantee or warranty is implied. In accepting delivery, the purchaser assumes full responsibility for proper installation and service arrangements.

This warranty is valid only if the Owner's Registration Card has been filled out by the purchaser and mailed to the Multi-Elmac Co. at the time of original purchase.

This warranty is void if the equipment has been modified or if failure is due to the application of voltages other than those specified in this manual.

Do not return any equipment or accessory direct to the factory without first obtaining authorization from the factory. All equipment to be returned shall be shipped pre-paid and insured by the owner.

Any claims for damage or loss in transit must be filed with the carrier. The Multi-Elmac Co. will give any necessary assistance in filing such claims.

The Multi-Elmac Co. reserves the right to make changes in current production models without being obligated to incorporate such changes in earlier production models.

Multi-Elmac Company

DM 190-763

LITHO IN U.S